NDIA
SMALL ARMS SYMPOSIUM
(Session III Ammunition)

THE ULTIMATE SOLUTION FOR THE ULTIMATE WARRIOR

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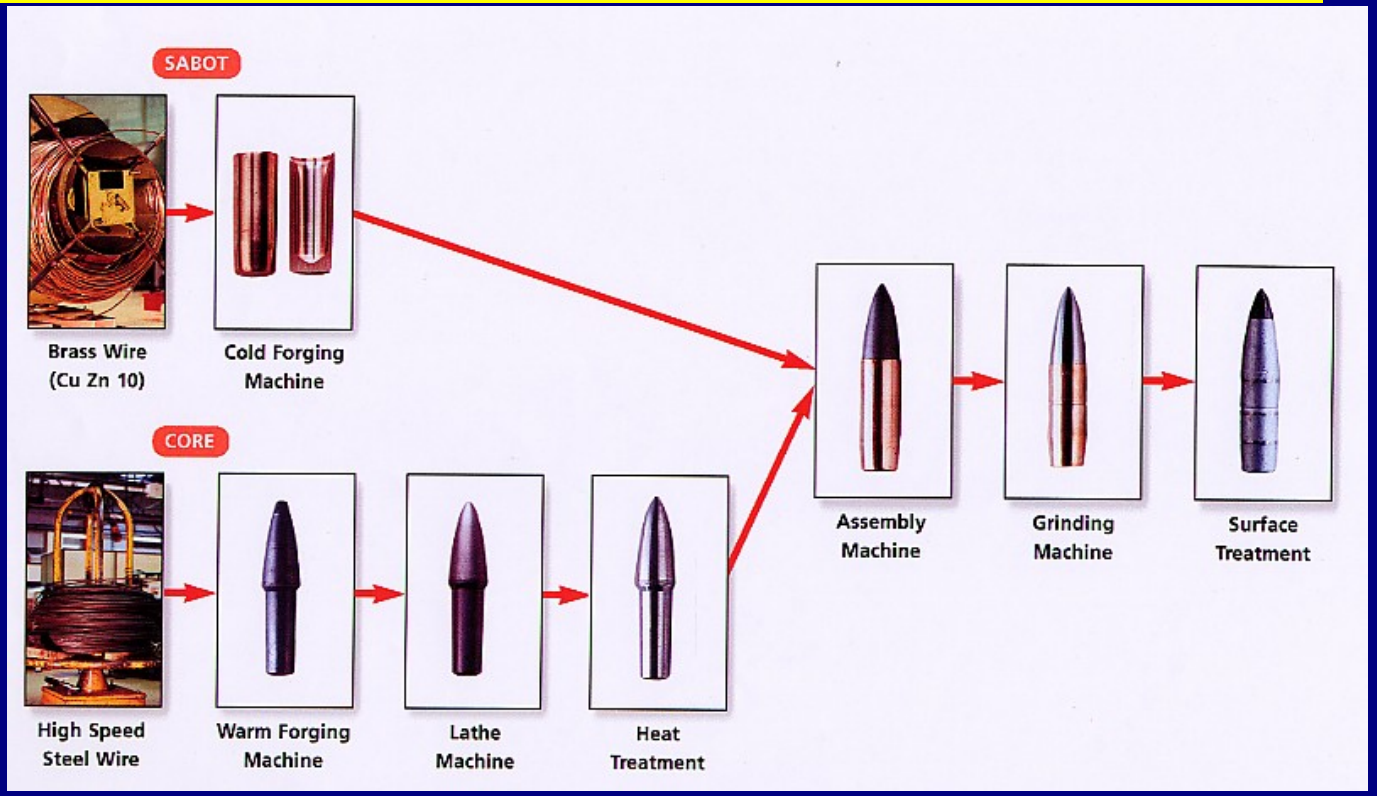
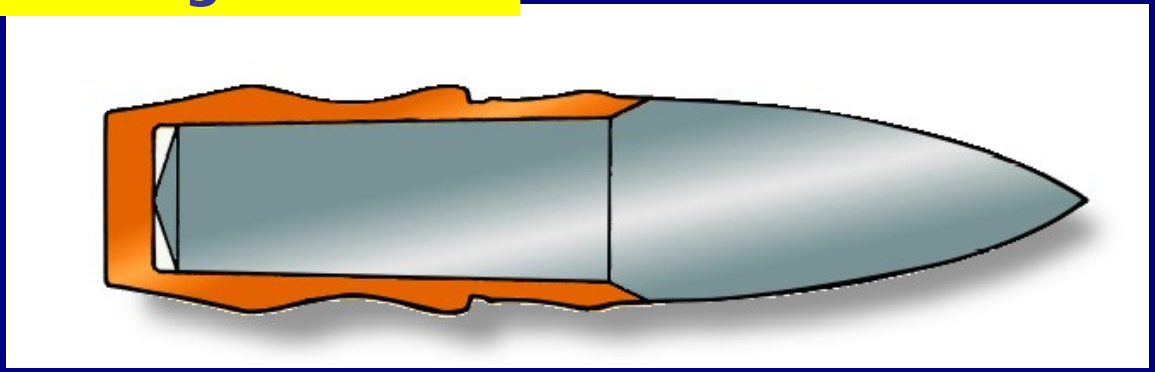
PPI AMMUNITION FOR SMALL CALIBER

- 12.7 mm LRSA
- 12.7 mm AP2
- 7.62 N AP1

12.7 mm PPI Armor Piercing Bullet Manufacturing Process



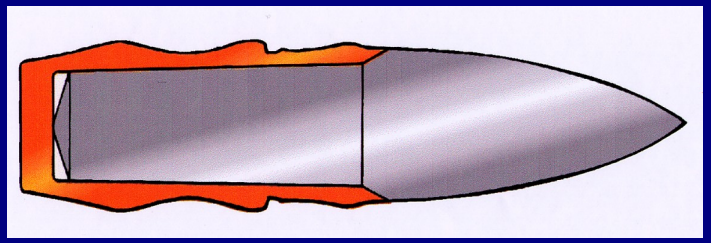
PPI Ammunition Advantages



- Minimum Components
- Preserved Barrel Life
- Low Cost Manufacturing Process
- High Accuracy
- Green Components
- No Tungsten
- Maximized Kinetic Effects on the Targets

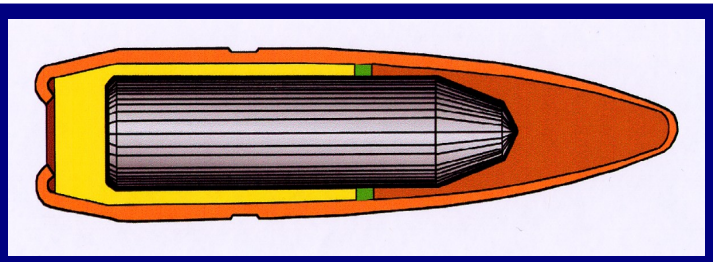
12.7 mm AP Projectile Organization

PPI 12,7 mm AP projectile



- 2 components
- Maximum core diameter
- Maximum core volume

12,7 mm Tungsten carbide projectile



- 4-5 components
- Reduced core diameter
- Reduced core volume

Maximum Kinetic Effects on the Target

PPI 12,7 AP projectile

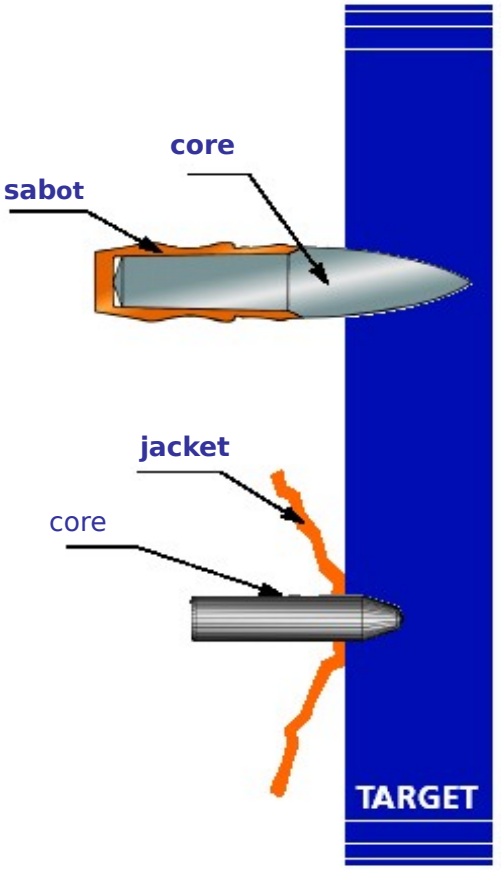
Sabot energy added to penetration

33% of the energy of the projectile

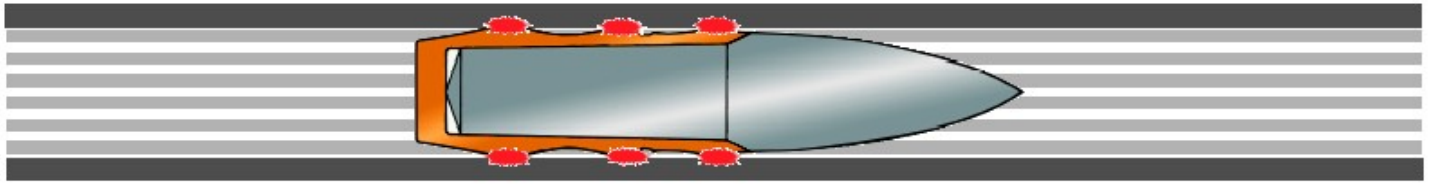
AP standard jacketed projectile

Jacket energy lost on contact

35% of the energy of the projectile



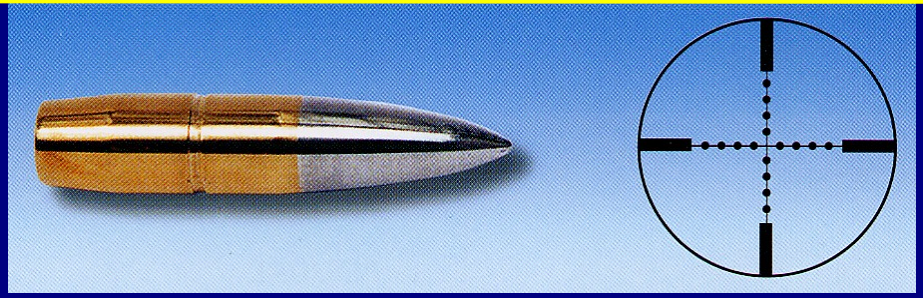
Preserved Barrel Erosion



The groovy profile of the brass sabot preserves the barrel from excessive erosion.

After 5,000 PPI AP rounds fired in a M2HB, the barrel erosion is the same as after 5,000 M33 fired rounds.

LRSA Long Range Sniper Ammunition
XM1022



Scope:

For the .50 sniper marksmen, training as much as possible is the key for the best performances.

For a training use, the MK211 combat round, relative to its high terminal performances, is often too costly, not always available and can contribute to range contamination.

LRSA Training G4:

The G4 round is especially designed to match the trajectory of the MK211, up to 1,000 meters range.

The projectile consists of:

- A brass sabot which twists in the barrel and preserves the barrel life.
- A light alloy core giving the correct weight and the right position for the center of gravity.

Technical data for LRSA Training G4

Projectile:

- Weight 42.3 grams (652 grains)
- Environmentally friendly (green ammo)

Cartridge:

- Velocity V0 (in a 36” barrel) 892 m/s
- Pressure EPVAT < 450 MPa
- Accuracy < 1 MOA
- Matching trajectory < 1 MOA

  (referring to MK211)

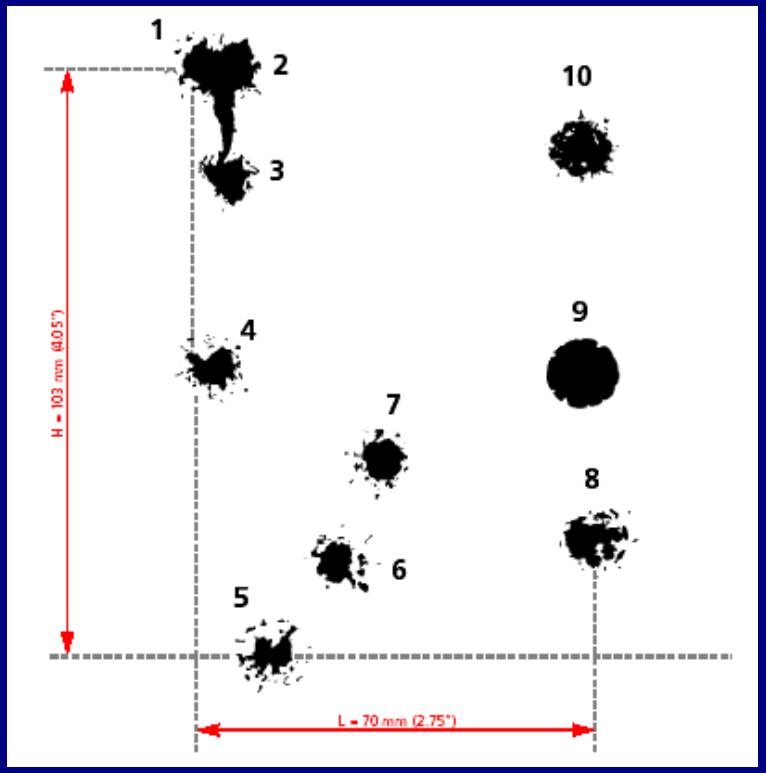
LRSA Accuracy Results

36" test barrel	Range 550 m		Range 1,000 m	
type of ammunition	Mean Radius	MOA	Mean Radius	MOA
LRSA Training G4	**3.3**	**0.5**	**7.1**	**0.6**
MK 211	5.6	0.9	10.7	0.9
NATO reference	6.7	1.1	14.0	1.2

Sniper rifle HECATE II	Range 550 m		Range 1,000 m	
type of ammunition	Mean Radius	MOA	Mean Radius	MOA
LRSA Training G4	**2.1**	**0.3**	**11.8**	**1.0**
MK 211	4.0	0.6	8.1	0.7
NATO reference	6.6	1.0	14.0	1.2

LRSA Training G4

Range: **600 yards**
45” test barrel



Vertical: 4.05” (103 mm)

Horizontal: 2.75” (70 mm)

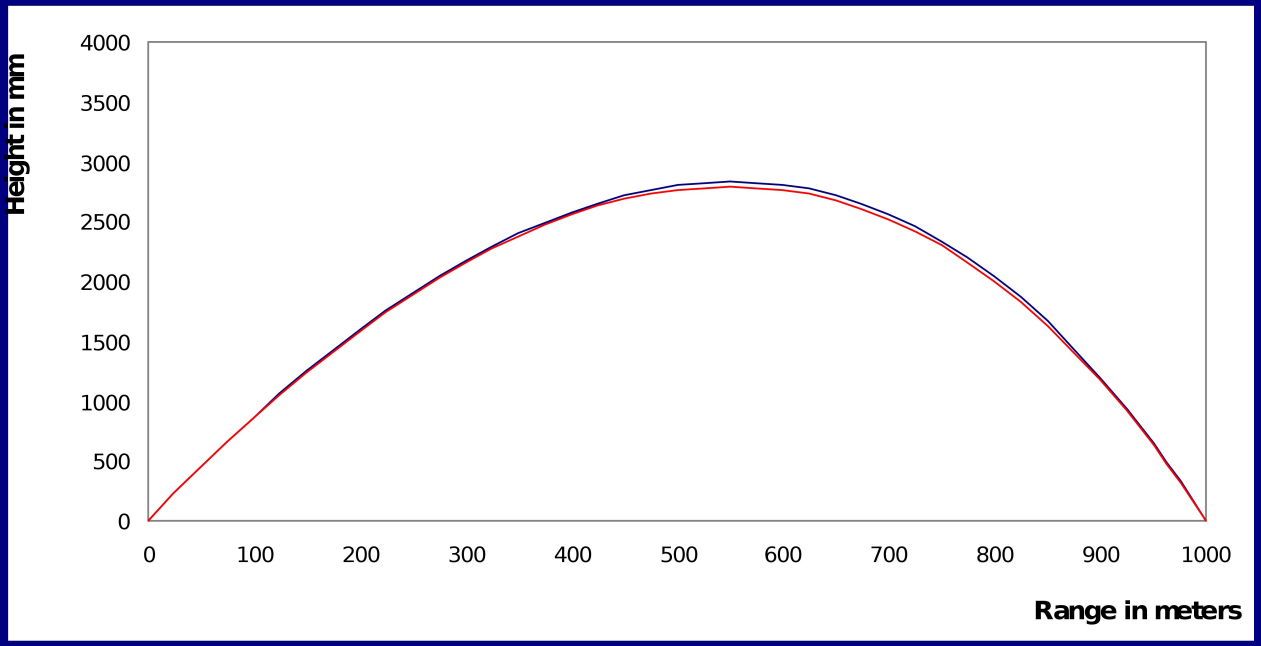
M.R.: 1.7” (44 mm)

MOA: 0.3

E.S.: 4.2” (106 mm)

MOA: 0.7

Match Trajectory, LRSA Training G4 / MK211

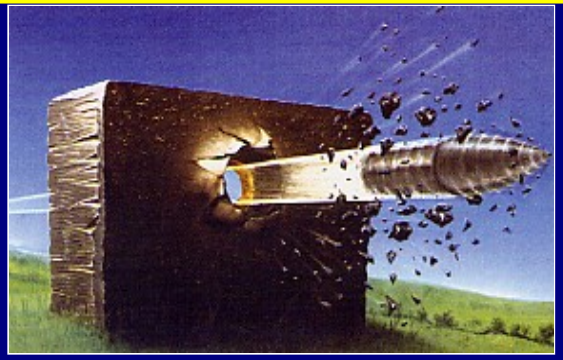


range (m)	total drift (inches)	MOA
550	1.2	0.2
1,000	10.9	0.9

MK 211

Training G4

12.7 mm AP2 Armor Piercing Ammunition



Scope:

Facing more and more well protected targets, 12.7 mm ammunition also needs to increase its destructive capability.

High efficiency and Accuracy are two of the most essential performances criteria of modern rounds.

PPI Concept:

The armor piercing PPI projectile consists of:

A penetrator made of hard steel. Its weight and profile are designed for a maximum penetration and for giving the largest hole possible.

- A brass rear sabot which catches the barrel grooves and preserves the barrel life.
- Its total energy is largely converted in penetration effects especially on multiplate targets.

Technical data for the 12.7 mm AP2 round

Projectile:

- Weight 48.5 grams (748 grains)
- Environmentally friendly (green ammo)

Cartridge:

- Velocity V0 (in a 45” barrel) 892 m/s
- Pressure EPVAT < 450 MPa
- Action time < 4.5 ms
- Accuracy < 1 MOA

(all characteristics are according to STANAG n° 4383 edition 1)

AP2 round adaptable to the weapon

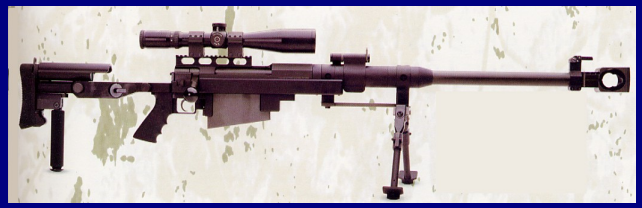
- **AP2** can be fired in any machine gun or sniper rifle.

- **AP2** round can be mixed with any Tracer ammo or other type, matching the NATO requirements.

- **AP2** round preserves the barrel life as well as the Ball ammo.

- **AP2** round is a totally green ammo.

- **AP2** round fulfils the International Conventions.



Terminal ballistic performances of the 12.7 mm AP2 round

- Highly accurate ammo due to the simple design and the unique machining process.
- Maximum size of the penetration hole.
- Highest volume and mass of the penetrator.
- High penetration either on single protection or on multiplate targets.

AP2 core Tungsten carbide cores

Penetration performances of the 12.7 mm AP2 round

TARGETS Armor plate 360 HB	Range : meters 200	400	600	800	1000
Thickness 25 mm	320				
Thickness 20 mm			600		
Thickness 13 mm					1000

mild steel

Ft Benning Georgia

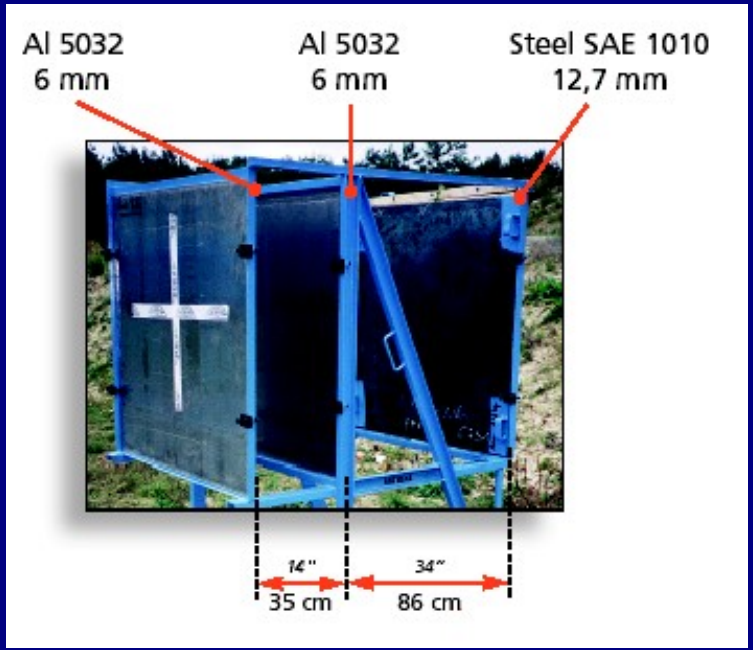
Sniper school

24th january 03

1” armor plate, 220 m

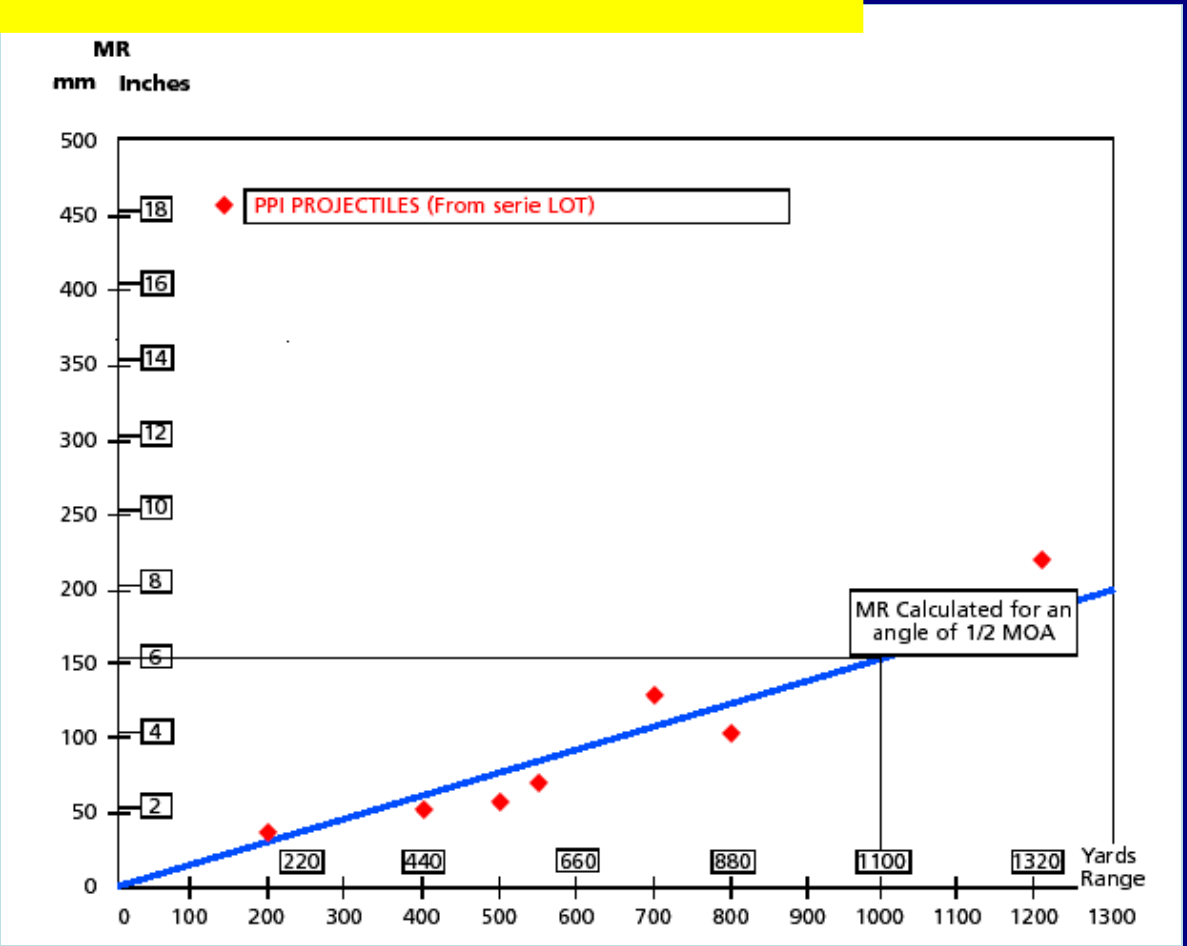
MK 263 Performances Requirements

US NAVY Multiplate Target



AP2 round defeats the multiplate target over 750 m (> 800 yards) range

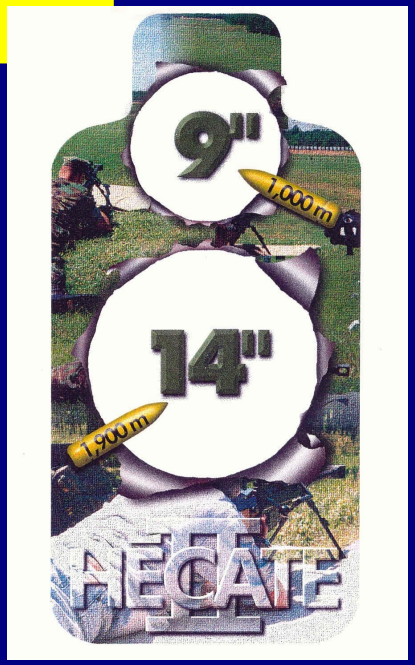
Accuracy test results with 12.7 mm AP2



Accuracy results on AP2 rounds fired in a sniper rifle

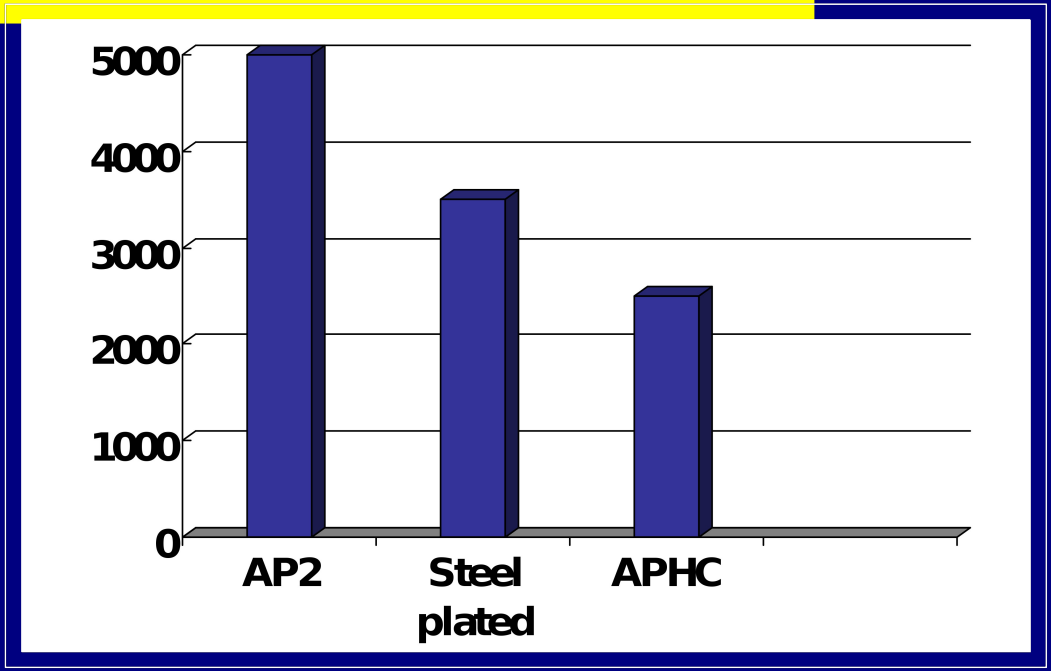
Aberdeen Proving Ground:

Range (m)	AP2 12.7 mm (inches)		MK211 MR (inches)	MK211 MOA
1.200	**7.6**	**0.55**	**23.4**	**1.7**
1.500	**19.3**	**1.1**	**32.1**	**1.9**



range (yrds)	AP2 12.7 mm MR (inches)	AP2 12.7 mm MOA	MK211 MR (inches)	MK211 MOA	A-Max MR (inches)	A-Max MOA	Win Practice MR (inches)	Win Practice MOA
300	**2.4**	**0.76**	**2.5**	**0.79**	**3.0**	**0.96**	**3.1**	**1.0**
600	**3.3**	**0.52**						

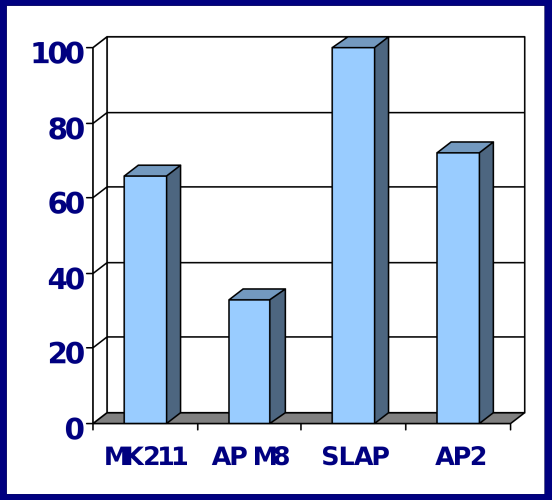
Barrel life benefits for 12.7 mm rounds:



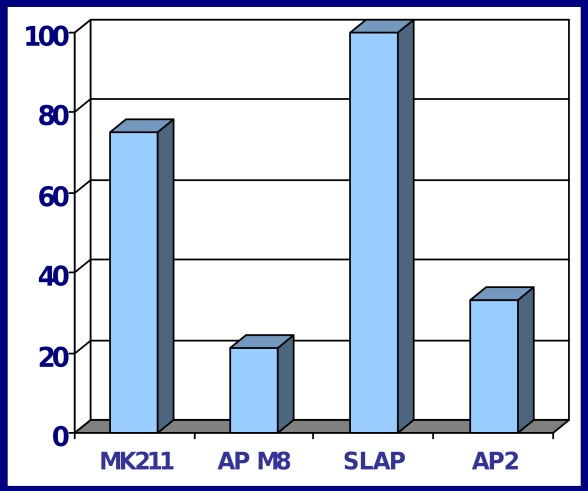
The barrel life depends of:

- The nature of the barrel: normal steel, chromed steel, stellited steel.
- The rate of fire, the warmer the barrel the shorter its life.
- The design of the projectile and jacket or sabot especially for AP bullet.

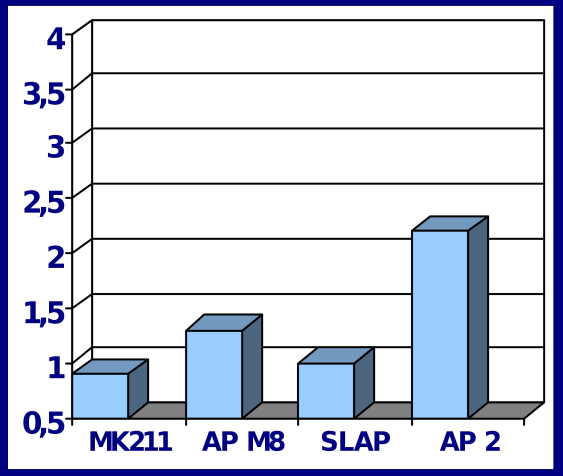
AP 12.7 mm rounds comparison summary



Penetration performance



Cost



Ratio performance/cost

AP2 PPI Demonstrations in US

Past Positive Performances:

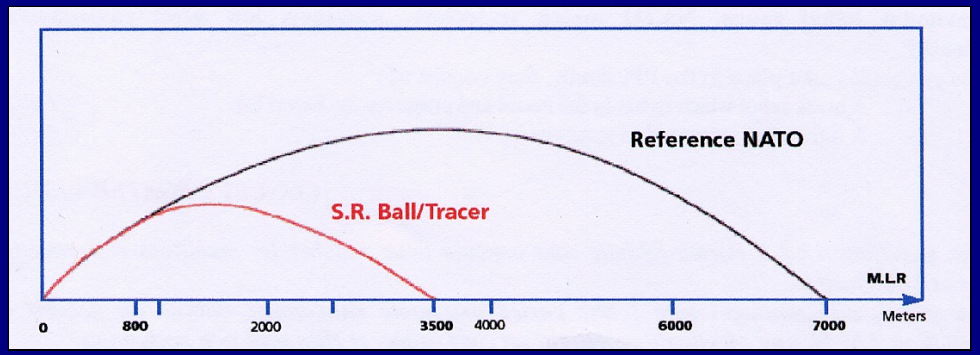
- US ARMY – Aberdeen Proving Ground
- USMC – Scout Sniper School
- Barrett, Mc Millan, FN USA
- US ARMY Sniper School
- FBI – HRT
- FCSA – Skip Talbot
- Viking Alliance
- Norm Chandler

Continuing test, Evaluation & Demo:

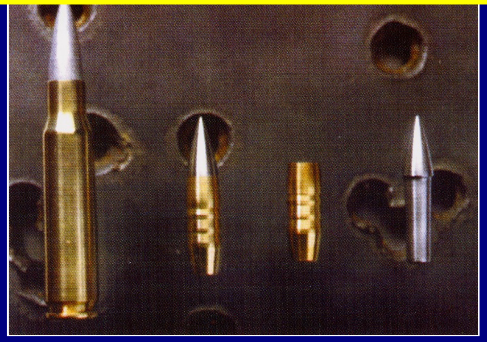
- US ARMY - ARDEC
- US NAVY – CRANE
- OFW – Wexford Group
- US Border Patrol
- US ARMY – Ft Bragg – SOCOM
- USMC – SYSCOM
- GDATP – GAU19

Qualification test of the AP2 ammo in the GAU-19/A system is in process

12.7 mm Short Range



7.62 x 51 N AP1 Armor Piercing Ammunition



Scope:

Facing more and more well protected targets, 7.62 N Ball ammunition are less and less able to defeat their goal.

High terminal efficiency and Accuracy are two of the essential performances of modern rounds expected by the Defense Forces.

PPI Concept:

The armor piercing PPI 7.62 N projectile consists of:

- A penetrator made of hard steel. Its weight and profile are studied for a maximum penetration and for giving the biggest hole as possible.
- A wavy brass rear sabot which catches the barrel grooves and preserves the barrel life.

Its total energy is largely converted in penetration effects.

Technical data for the 7.62 N AP1 round

Projectile:

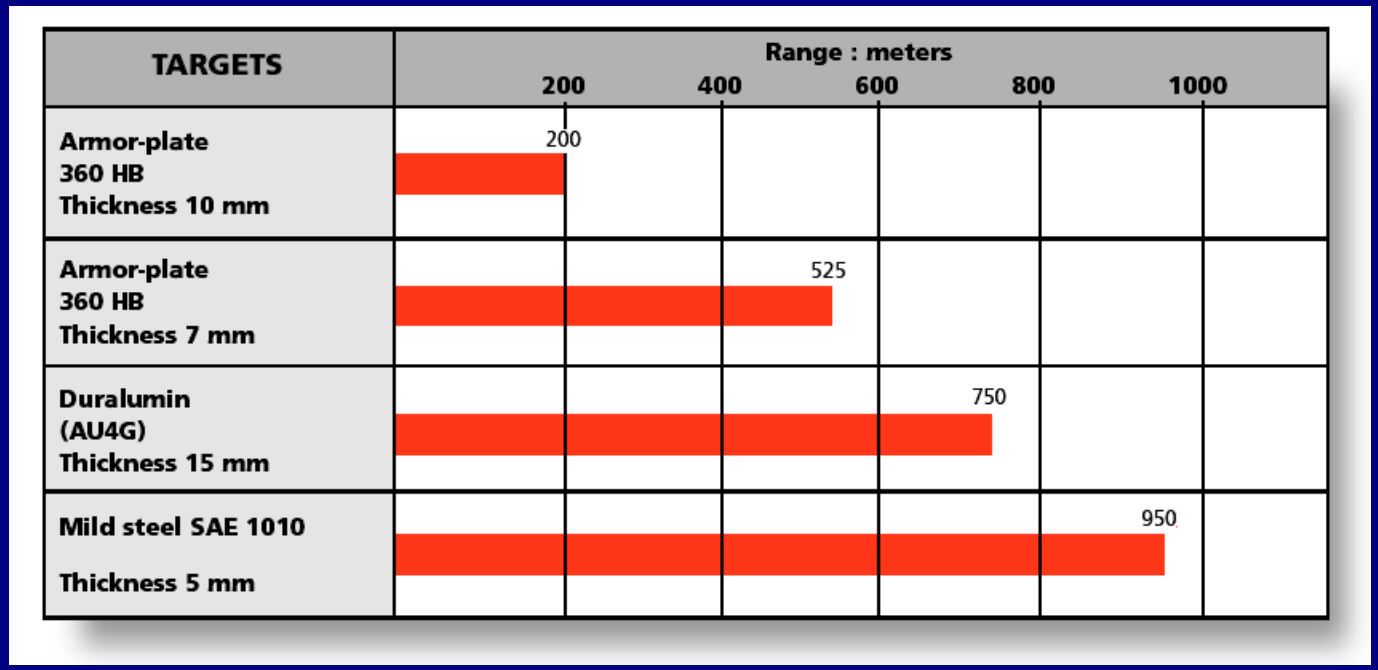
- Weight 9.5 grams (147 grains)
- Environmentally friendly (green ammo)

Cartridge:

- Velocity V0 (in a NATO velocity barrel) 835 m/s
- Pressure EPVAT < 380 MPa
- Action time < 4.0 ms
- Accuracy < 1 MOA

(all characteristics are according to STANAG n° 2310 edition 3)

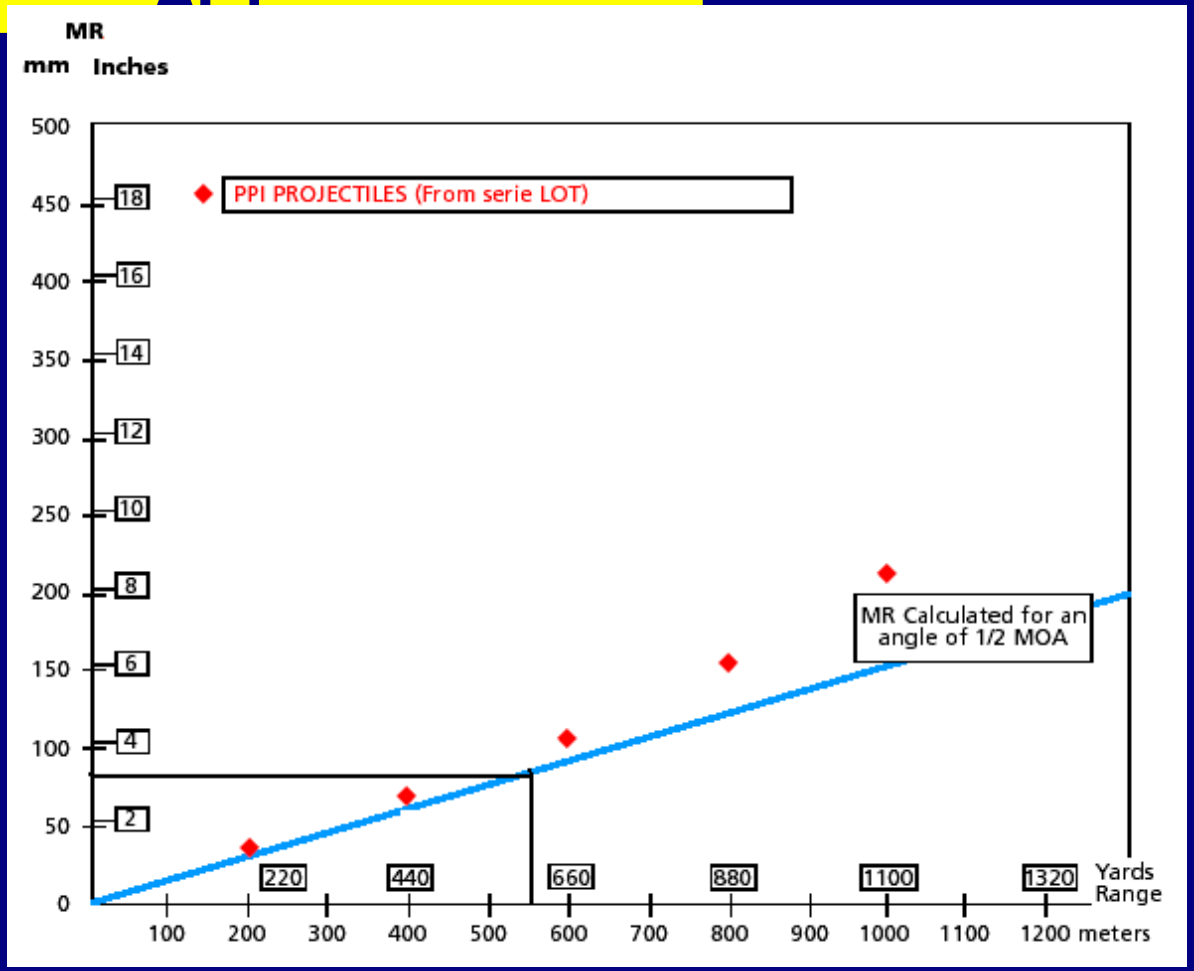
Penetration performances of the 7.62 N AP1 round



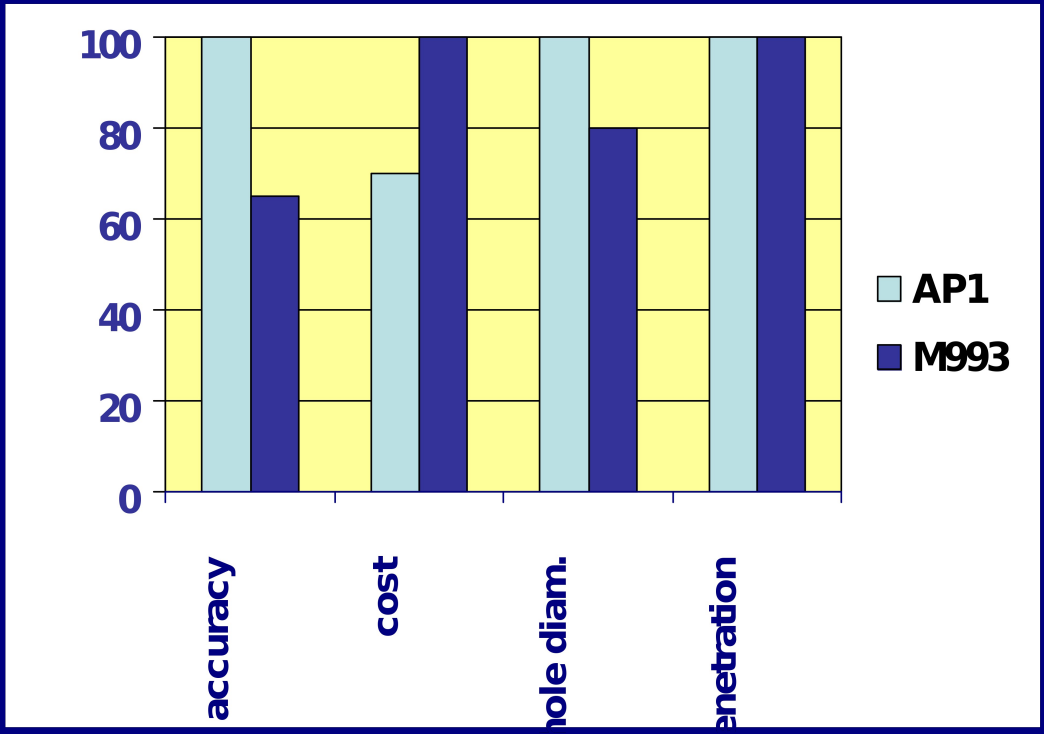
7.62 N AP1: Efficiency on Individual Protection

	Body Armor Vest Class III (NIJ)	Body Armor Vest Class IV (NIJ)	Body Armor Vest NATO Crisat target	Combat Helmet
7.62 N Ball ammo	Stopped	Stopped	Stopped	Stopped
7.62 N AP1 ammo	Penetration	Penetration	Penetration	Penetration

Accuracy test results on 7.62 N AP1



Ratio AP1 versus M993



Advantages of the AP1 PPI 7.62 N

For a similar penetration:

- Better accuracy
- Lower cost
- Larger hole
- Nato trajectory
- No tungsten
- Green ammo
- Preserved barrel life